

AMENDMENTS TO THE CLAIMS

1. (Currently amended) A vinyl-urethane copolymer comprising comprising:

at least one vinyl polymer chain and at least one urethane polymer chain, the vinyl polymer chain being combined with the urethane polymer chain through the intermediary of a linkage segment having a silicon-oxygen bond,

wherein the linkage segment having a silicon-oxygen bond is bonded to the urethane polymer chain and the vinyl polymer chain,

wherein the urethane polymer chain is a residue of a urethane polymer (A) having at least one silicon-containing hydrolyzable group, and the vinyl polymer chain is a residue of a polymer derived from an ethylenically unsaturated monomer (B) and a compound (C) as monomer components, wherein the compound (C) comprises at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive with an ethylenically unsaturated bond-containing group, and

wherein the bonding between the urethane polymer chain and the linkage segment is at the terminal of the urethane polymer chain.

2. (Cancelled)

3. (Previously Presented) The vinyl-urethane copolymer of claim 1, wherein the linkage segment is a silicone polymer chain.

4. (Original) The vinyl-urethane copolymer of claim 3, wherein the silicone polymer chain is derived from: a silicon-containing hydrolyzable group of a urethane polymer (A) having at least one silicon-containing hydrolyzable group; a functional group reactive with a silicon-containing hydrolyzable group of a compound (C) having at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive with an ethylenically unsaturated bond-containing group; and a silane compound (D) comprising at least one silicon-containing hydrolyzable group.

5. (Currently amended) The vinyl-urethane copolymer of ~~claim 2~~, claim 1, wherein the urethane polymer (A) having at least one silicon-containing hydrolyzable group is an alkoxy silylated urethane polymer (A1) containing at least one hydrophilic group.

6. (Original) The vinyl-urethane copolymer of claim 5, wherein the alkoxy silylated urethane polymer (A1) containing at least one hydrophilic group is a urethane polymer containing at least one hydrophilic group and having at least one terminal alkoxy silyl group, the urethane polymer corresponding to a hydrophilic group-containing urethane polymer, except with at least part of terminal isocyanate groups being alkoxy silylated.

7. (Previously Presented) The vinyl-urethane copolymer of claim 5, wherein the alkoxy silylated urethane polymer (A1) containing at least one hydrophilic group is a urethane polymer containing at least one hydrophilic group and having at least one terminal alkoxy silyl group, as a reaction product among a compound (A1-a) containing plural isocyanate-reactive groups and having no hydrophilic group; a compound (A1-b) containing at least one hydrophilic group and plural isocyanate-reactive groups; a polyisocyanate compound (A1-c); and an alkoxy silane compound (A1-d) containing at least one isocyanate-reactive group.

8. (Previously Presented) The vinyl-urethane copolymer of claim 4, wherein the silane compound (D) having a silicon-containing hydrolyzable group is an alkoxy group-containing silane compound.

9. (Currently amended) The vinyl-urethane copolymer of ~~claim 2~~, claim 1, wherein the ethylenically unsaturated monomer (B) comprises an acrylic monomer.

10. (Currently amended) The vinyl-urethane copolymer of ~~claim 2~~, claim 1, wherein the compound (C) having at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive with an ethylenically unsaturated bond-containing group is a compound comprising a silicon-containing hydrolyzable group and

an ethylenically unsaturated bond-containing group, or a compound comprising a silicon-containing hydrolyzable group and a mercapto group.

11. (Currently amended) A method for producing a vinyl-urethane copolymer comprising at least one vinyl polymer chain and at least one urethane polymer chain, the vinyl polymer chain being combined with the urethane polymer chain through the intermediary of a linkage segment having a silicon-oxygen bond, the method comprising following Steps (X) and (Y):

Step (X) of carrying out preparation of an aqueous dispersion or aqueous solution of a urethane polymer (A) having at least one silicon-containing hydrolyzable group; and

Step (Y) of, in the aqueous dispersion or aqueous solution of the urethane polymer (A) having at least one silicon-containing hydrolyzable group, carrying out polymerization of an ethylenically unsaturated monomer (B), and carrying out preparation of a vinyl-urethane copolymer using a compound (C) in at least one period selected from the group consisting of before the polymerization reaction, during the polymerization reaction, and after the polymerization reaction, the compound (C) having at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive with an ethylenically unsaturated bond-containing group,

wherein the linkage segment having a silicon-oxygen bond is bonded to the urethane polymer chain and the vinyl polymer chain in the vinyl-urethane copolymer, and

wherein the bonding between the urethane polymer chain and the linkage segment is at the terminal of the urethane polymer chain.

12. (Original) The method for producing a vinyl-urethane copolymer of claim 11, wherein Step (Y) is at least one step selected from the group consisting of following Steps (Y1-a), (Y1-b), (Y1-c), and (Y1-d):

Step (Y1-a) of, in the aqueous dispersion or aqueous solution of the urethane polymer (A) having at least one silicon-containing hydrolyzable group, carrying out the polymerization of the ethylenically unsaturated monomer (B) simultaneously with a reaction

using the compound (C) having at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive with an ethylenically unsaturated bond-containing group, to thereby yield a vinyl-urethane copolymer;

Step (Y1-b) of, in the aqueous dispersion or aqueous solution of the urethane polymer (A) having at least one silicon-containing hydrolyzable group, carrying out the polymerization of the ethylenically unsaturated monomer (B) and subsequently carrying out a reaction using the compound (C) having at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive with an ethylenically unsaturated bond-containing group, to thereby yield a vinyl-urethane copolymer;

Step (Y1-c) of, in the aqueous dispersion or aqueous solution of the urethane polymer (A) having at least one silicon-containing hydrolyzable group, carrying out a reaction using the functional group reactive with a silicon-containing hydrolyzable group of the compound (C) having at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive with an ethylenically unsaturated bond-containing group, and subsequently carrying out the polymerization of the ethylenically unsaturated monomer (B) simultaneously with a reaction using the functional group reactive with an ethylenically unsaturated bond-containing group of the compound (C) having at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive with an ethylenically unsaturated bond-containing group, to thereby yield a vinyl-urethane copolymer; and

Step (Y1-d) of, in the aqueous dispersion or aqueous solution of the urethane polymer (A) having at least one silicon-containing hydrolyzable group, carrying out a reaction using the functional group reactive with a silicon-containing hydrolyzable group of the compound (C) having at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive with an ethylenically unsaturated bond-containing group, subsequently carrying out the polymerization of the ethylenically unsaturated monomer (B) and a reaction using the functional group reactive with an ethylenically unsaturated bond-containing group of the compound (C) having at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive

with an ethylenically unsaturated bond-containing group simultaneously with a reaction using another additional portion of the compound (C) having at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive with an ethylenically unsaturated bond-containing group, to thereby yield a vinyl-urethane copolymer.

13. (Previously Presented) The method for producing a vinyl-urethane copolymer of claim 11, wherein Step (Y) is at least one step selected from the group consisting of following Steps (Y2-a), (Y2-b) and (Y2-c):

Step (Y2-a) of, in the aqueous dispersion or aqueous solution of the urethane polymer (A) having at least one silicon-containing hydrolyzable group, carrying out hydrolysis or condensation of a silane compound (D) having a silicon-containing hydrolyzable group, subsequently carrying out the polymerization of the ethylenically unsaturated monomer (B) and carrying out preparation of a vinyl-urethane copolymer using the compound (C) having at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive with an ethylenically unsaturated bond-containing group in at least one period selected from the group consisting of before the hydrolysis or condensation reaction, during the hydrolysis or condensation reaction, after the hydrolysis or condensation reaction and before the polymerization reaction, during the polymerization reaction, and after the polymerization reaction;

Step (Y2-b) of, in the aqueous dispersion or aqueous solution of the urethane polymer (A) having at least one silicon-containing hydrolyzable group, carrying out the polymerization of the ethylenically unsaturated monomer (B) simultaneously with hydrolysis or condensation of a silane compound (D) having a silicon-containing hydrolyzable group, and carrying out preparation of a vinyl-urethane copolymer using the compound (C) having at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive with an ethylenically unsaturated bond-containing group in at least one period selected from the group consisting of before the hydrolysis or condensation reaction and the polymerization reaction, during the hydrolysis or condensation reaction and the

polymerization reaction, and after the hydrolysis or condensation reaction and the polymerization reaction; and

Step (Y2-c) of, in the aqueous dispersion or aqueous solution of the urethane polymer (A) having at least one silicon-containing hydrolyzable group, carrying out the polymerization of the ethylenically unsaturated monomer (B), subsequently carrying out hydrolysis or condensation of a silane compound (D) having a silicon-containing hydrolyzable group, and carrying out preparation of a vinyl-urethane copolymer using the compound (C) having at least one functional group reactive with a silicon-containing hydrolyzable group and at least one functional group reactive with an ethylenically unsaturated bond-containing group in at least one period selected from the group consisting of before the polymerization reaction, during the polymerization reaction, after the polymerization reaction and before the hydrolysis or condensation reaction, during the hydrolysis or condensation reaction, and after the hydrolysis or condensation reaction.

14. (Original) The method for producing a vinyl-urethane copolymer of claim 13, wherein the silane compound (D) having a silicon-containing hydrolyzable group comprises a silane compound having at least one functional group reactive with an ethylenically unsaturated bond-containing group in combination with a silane compound free from a functional group reactive with an ethylenically unsaturated bond-containing group.

15. (Previously Presented) The method for producing a vinyl-urethane copolymer of claim 11, wherein Step (X) is following Step (X1):

Step (X1) of carrying out preparation of a urethane polymer (A) having at least one silicon-containing hydrolyzable group using an ethylenically unsaturated monomer (B) as a solvent to yield a reaction mixture, and dispersing or dissolving the reaction mixture in water to thereby yield an aqueous dispersion or aqueous solution of the urethane polymer (A) having at least one silicon-containing hydrolyzable group.

16. (Previously Presented) The method for producing a vinyl-urethane copolymer of claim 11, wherein the urethane polymer (A) having at least one silicon-containing hydrolyzable group used in Step (X) is an alkoxy silylated urethane polymer (A1) containing at least one hydrophilic group.

17. (previously presented) The vinyl-urethane copolymer of claim 1, wherein the vinyl-urethane copolymer is an aqueous dispersion.

18. (New) The vinyl-urethane copolymer of claim 1, wherein the bonding between the vinyl polymer chain and the linkage segment is at any one of the branch chains of the vinyl polymer chain.

19. (New) The method for producing a vinyl-urethane copolymer of claim 11, wherein the bonding between the vinyl polymer chain and the linkage segment is at any one of the branch chains of the vinyl polymer chain.